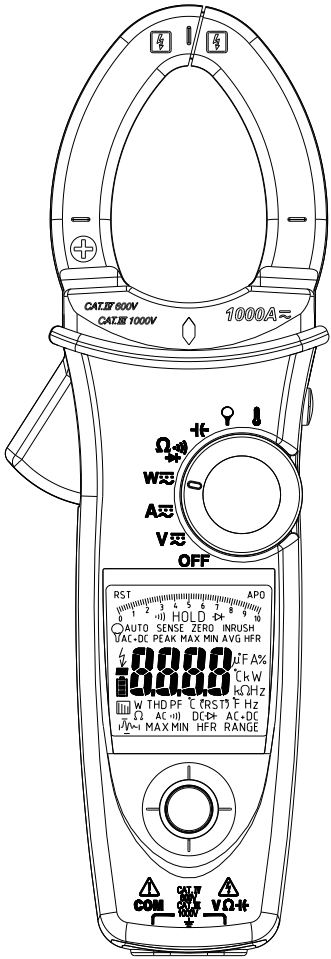
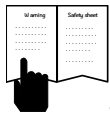
User Manual

METRAVI 107F





 # Read First

Safety Information

Understand and follow operating instructions carefully.
Use the meter only as specified in this manual; otherwise, the protection provided by the meter may be impaired.

WARNING

Identifies hazardous conditions and actions that could cause **BODILY HARM** or **DEATH**

CAUTION

Identifies conditions and actions that could **DAMAGE** the meter or equipment under test

WARNING

- When using test leads or probes, keep your fingers behind the finger guards.
- Individual protective equipment should be used if HAZARDOUS LIVE parts in the installation where measurement is to be carried out could be ACCESSIBLE.
- Remove test lead from Meter before opening the battery door or Meter case.
- Use the Meter only as specified in this manual or the protection by the Meter might be impaired.
- Always use proper terminals, switch position, and range for measurements.
- Verify the Meter's operation by measuring a known voltage. If in doubt, have the Meter serviced.
- Do not apply more than the rated voltage, as marked on Meter, between terminals or between any terminal and earth ground.
- Use caution with voltages above 30 Vac rms, 42 Vac peak, or 60 Vdc. These voltages pose a shock hazard.
- To avoid false readings that can lead to electric shock and injury, replace battery as soon as low battery indicator.
- Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.
- Do not use Meter around explosive gas or vapor.
- To reduce the risk of fire or electric shock do not expose this product to rain or moisture.
- Probe assemblies to be used for MAINS measurements shall be RATED as appropriate for MEASUREMENT CATEGORY III or IV according to EN 61010-031 and shall have a voltage RATING of at least the voltage of the circuit to be measured.

CAUTION

- Disconnect the test leads from the test points before changing the position of the function rotary switch.
- Never connect a source of voltage with the function rotary switch in Ω, %, μA, position.
- Do not expose Meter to extremes in temperature or high humidity.
- Never set the meter in Ω, %, μA, function to measure the voltage of a power supply circuit in equipment that could result in damage the meter and the equipment under test.

Symbols as marked on the Meter and Instruction manual

"	Risk of electric shock
#	See instruction card
'	DC measurement
1	Equipment protected by double or reinforced insulation
	Battery
)	Earth
%	AC measurement
6	Conforms to EU directives
E	Application around and removal from hazardous live conductors is permitted
	Do not discard this product or throw away.

Unsafe Voltage

To alert you to the presence of a potentially hazardous voltage, when the Tester detects a voltage ≧30 V or a voltage overload (OL) in V . The smbol is displayed.

Maintenance

Do not attempt to repair this Meter. It contains no userserviceable parts. Repair or servicing should only be performed by qualified personnel.

Cleaning

Periodically wipe the case with a dry cloth and detergent.
Do not use abrasives or solvents.

Feature

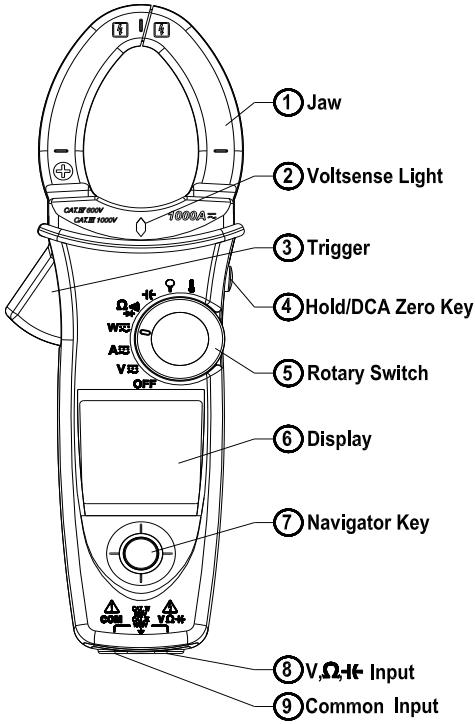
- 10000 Count digital display
- Active Backlit,Large scale display
- VoltSense (None Contact Voltage)
- Analog Bar graph
- True RMS reading on AC and AC+DC mode
- Torch lightening when clamping
- Auto AC/DC 1000 Amps capability and selection
- Auto AC/DC 1000 Volts capability and selection
- Auto Ohms/Continuity/Diode selection
- 100K Resistance capability
- Continuity Beeper
- Frequency Counter
- Power and Power factor measurement
- Total Harmonics distortion and Harmonics 1 to 25
- Capacitance capability
- °C / °F Temperature Function
- Inrush Current
- DCA Auto-Zeroing Key
- Peak Hold
- MIN/MAX HOLD
- Smart Data Hold
- Phase rotation indication
- Low pass Filter
- Auto Powet Off
- CAT.Ⅳ 600V / CAT.Ⅲ 1000V Safety Standard

Unpacking and Inspection

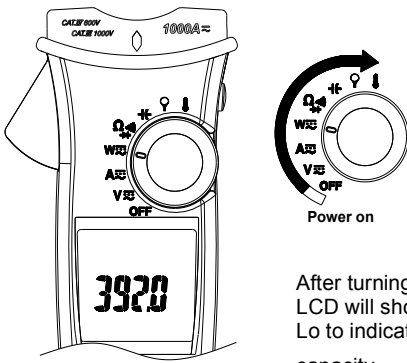
Upon removing your new Power Clamp Meter from its packing, you should have the following items:

1. METRAVI 107F Power Clamp Meter
2. Flexible Clamp for 3000A Measurement
3. Test leads. set (one black, one red)
4. Temperature Probe
5. User Manual
6. Carrying case
7. Battery Installed

The Meter Description

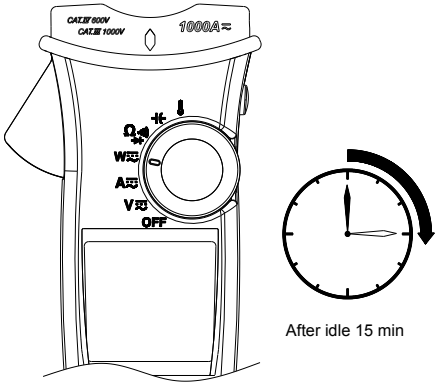


Power On/ Off



After turning on the meter, the LCD will show Full, hAlf, and Lo to indicate the battery capacity.

Auto Power Off



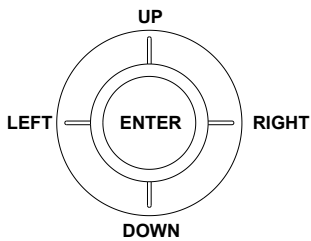
After idle 15 min

The meter can work again by turning it on from the OFF position.

Auto Power Off (APO) disable :

Press “Downward” of Navigator key while tuning meter on from OFF position.

Navigator KEY



The Navigator Key has 5 directions of switch on the display, toggle the navigator key to select the desired feature to activate the feature by a simple click.

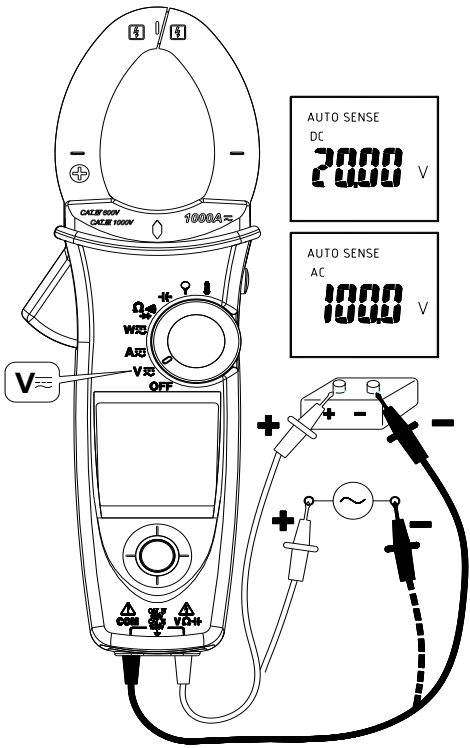
Making Basic Measurements

Preparation and Caution Before Measurement

: **Observe the rules** of **#** Warnings and **#** Cautions
The figures on the following pages show how to make basic measurements.

When connecting the test leads to the **DUT** (Device Under Test) connect the common test lead before connecting the live lead ; when removing the test leads, remove the test live lead before removing the common test lead.

Measuring Voltage

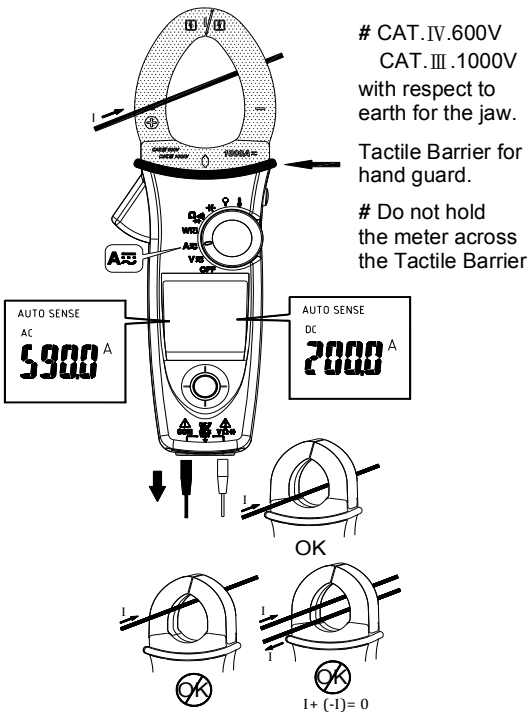


Warning

To avoid electrical shock, hazard or damage to meter, do not attempt to measurement that might exceed 1000 V DC or AC RMS. Do not apply more then 1000 V DC or AC RMS between the comment input terminal and earth ground.

Note - If the measured voltage is greater than 30 V DC or AC RMS, the display will show the " ϟ " symbol.

Measuring Current



- Don't clamp on any conductor while the meter power on.
- Torch lightening when clamping.

AUTO SENSE mode :

Display measurement result at AC only with RMS value or DC value, it depends on whichever is greater.

AC mode : AC only with RMS value.

DC mode : DC value.

AC+DC mode : AC+DC RMS value.

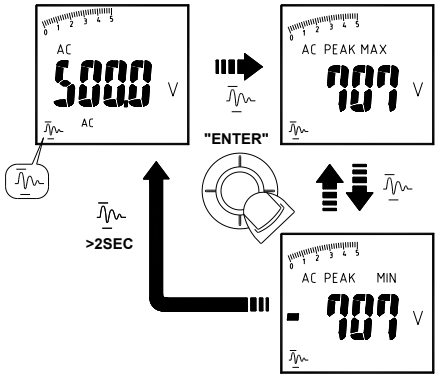
Note

- Select " AC", " DC" or " AC+DC" indicator then press the navigator key to enter the AC/DC/AC+DC mode.

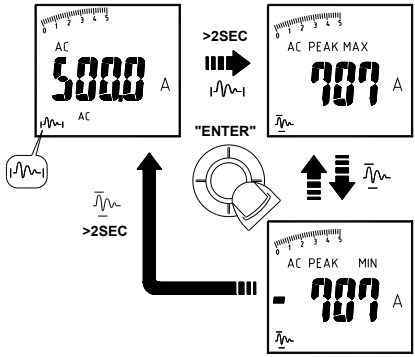
- Select " AC"," DC" or " AC+DC" indicator then press the navigator key for more than 2sec to return to the AUTO SENSE mode.

PEAK HOLD (AC mode only)

1. In ACV mode, select " " indicator on the display to enter PEAK HOLD mode. To quit from PEAK HOLD mode, press the navigator key for more than 2sec.



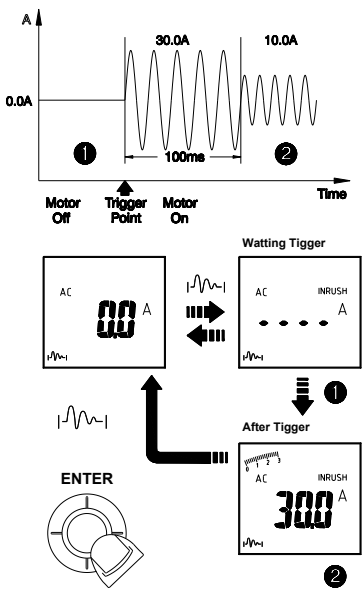
2. In ACA mode, select " " indicator then press the navigator key for more than 2sec to enter PEAK HOLD mode. To quit from PEAK HOLD mode, just press the navigator key for more than 2sec to return to the " " indicator.



In PEAK HOLD mode, the meter is activated to save the positive peak value and negative peak value. Positive peak value is displayed in PEAK MAX mode. Negative peak value is displayed in PEAK MIN mode.

Inrush current : (AC mode only)

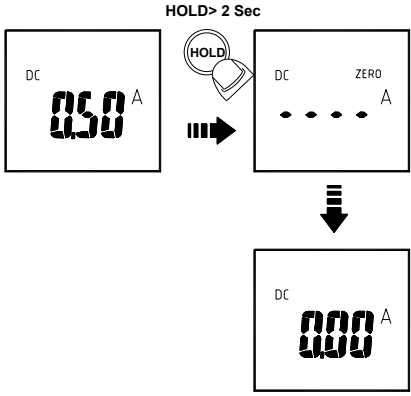
If the under testing Inrush current could be bigger than 100A ac, please select the range to 600A/1000A in advance before activating inrush current.



DCA ZERO

Remove the jaw out of the conductor.

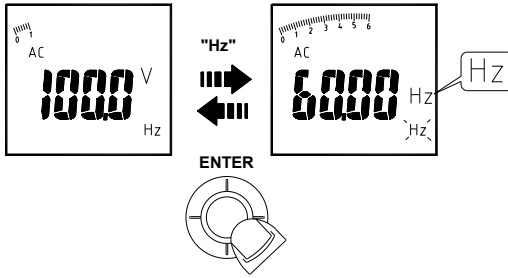
Press HOLD Key ＞2 Sec to compensate the residual magnetism.



- DCA Zero is only available in Auto Sense, DC and AC+DC mode.

Measuring Frequency (AC mode only)

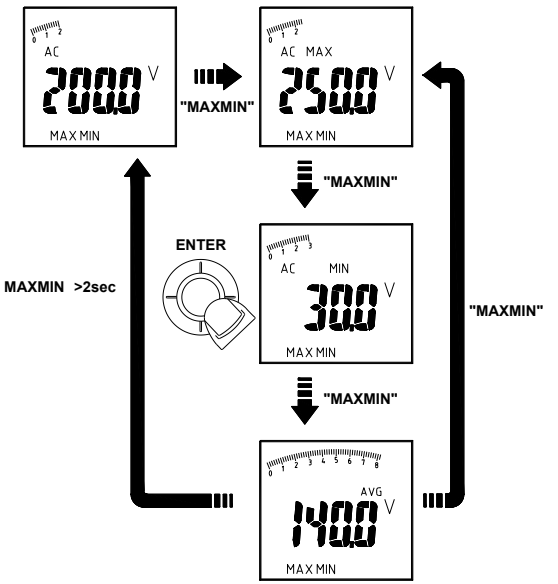
Select the "Hz" indicator then press the navigator key to enter/exit the frequency measurement mode.



MAX/MIN/AVG

Select the "MAX MIN" indicator then press the navigator key to enter the MAX/MIN/AVG mode. To quit from the MAX/MIN/AVG mode, press the navigator key for more than 2sec.

The MAX/MIN/AVG mode records the minimum and maximum input values. When the inputs go below the record minimum value or above the record maximum value, the meter records the new value. The MAX/MIN/AVG mode can also calculate the average of the maximum value and the minimum value.

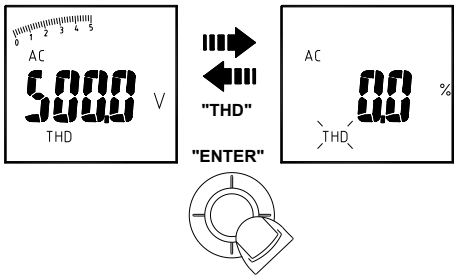


NOTE :

- Press HOLD key in MAX MIN mode to make the meter stop updating the maximum and minimum value. When the HOLD mode is nested in MAX MIN mode, the HOLD mode must be released before the MAX MIN mode.

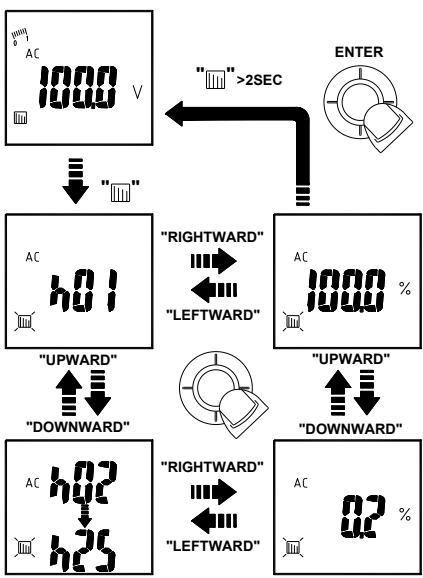
THD Measurement (AC mode only)

Select the "THD" indicator then press the navigator key to enter the THD mode.THD-F=RMS of Harmonics ÷ RMS of fundamental ×100%.(harmonics up to the 25th)



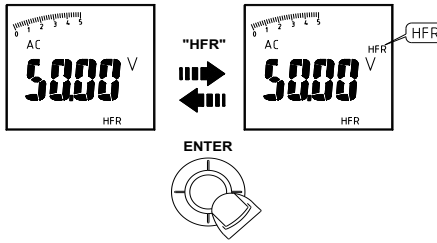
Individual Harmonic Measurement(AC mode only)

Select the " " indicator then press the navigator key to enter the individual harmonic mode. To quit from the individual harmonic mode, press the navigator key for more than 2sec. Hn=RMS of Individual Harmonic ÷ RMS of fundamental ×100%.



HFR(AC mode only)

Select the "HFR" indicator then press the navigator key to eliminate high frequency noise.



NOTE :

Peak Hold, Inrush, THD, HZ, individual Harmonic and HFR mode are only available in AC mode.

Measuring Active power(W)/Power factor(PF)

1.Single Phase Power Measurement

Step1. Set the rotary switch to the "W" position.
Step2. Connect the Red test lead to the L, and the Black test lead to the N.
Step3. Press the trigger to open the transformer jaws and clamp one conductor only, make sure that the jaw is firmly closed around the conductor.
Step4. Using the Navigator key to choose the "W/PF" mode.

NOTE :

- The " + " symbol on the jaw must face on the power source side.
- In AutoSense mode, The meter will displays ACW/DCW depends on if there has AC frequency been detected.

Active power sign :

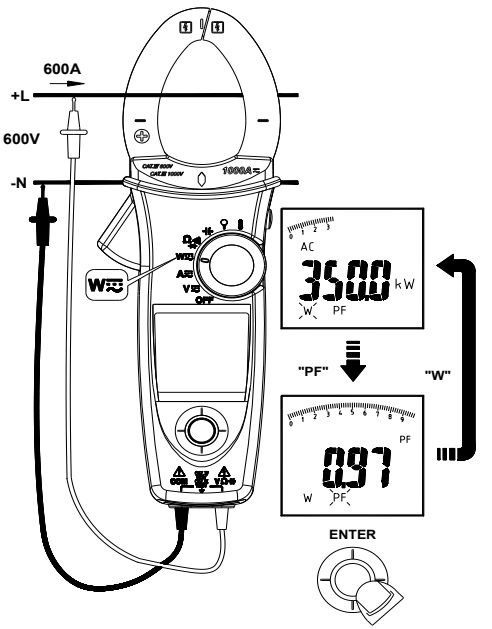
No sign : Indicates the power flows from the power source to the load.
"_" sign : Indicates the power flows from the load to the power source.

Power factor sign :

No sign : The phase of the current signal is lagging behind the voltage signal (inductive load).
"_" sign : The phase of the current signal is leading the voltage signal (capacitive load).

Overrange display :

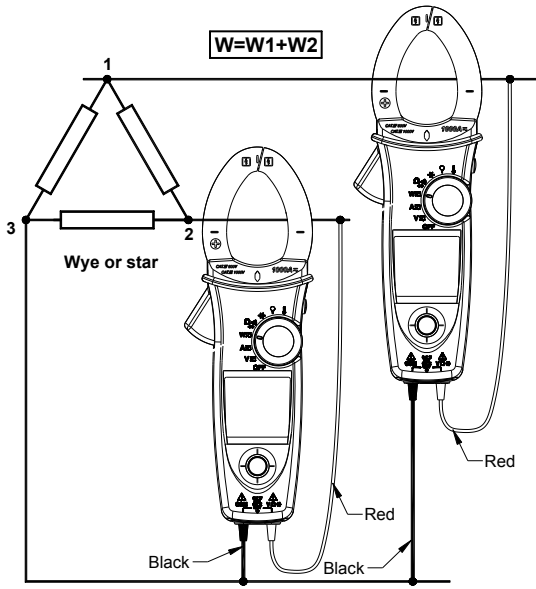
OL.U : Voltage overload
OL.A : Current overload
OL.UA : Both Voltage and current overload.
± OL kW : Active Power > 1000 kW or < -1000 kW.



2.Three Phase Power Measurement

A. 3 phase 3 wire balanced / unbalanced

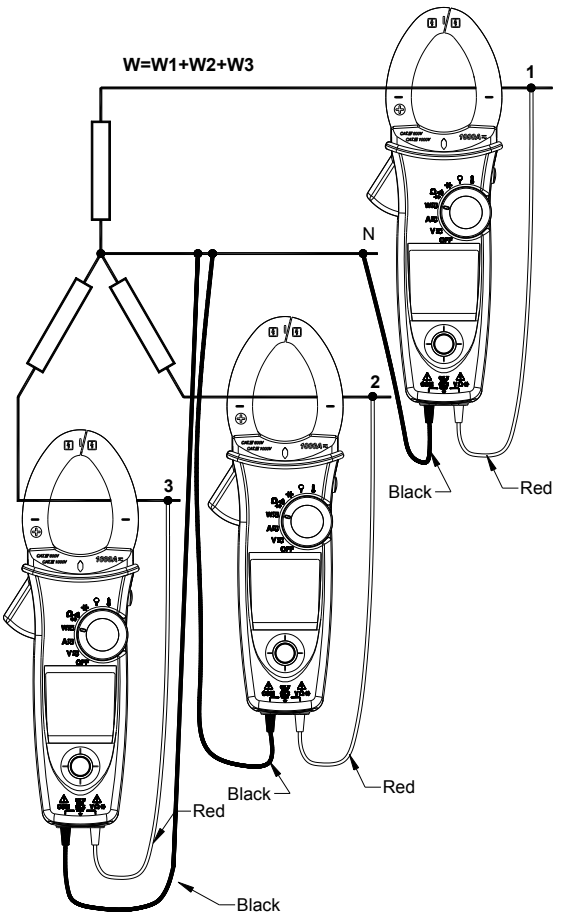
Step1. Set the rotary switch to the "W" position
Step2. Using the Navigator key to choose the "W" mode.



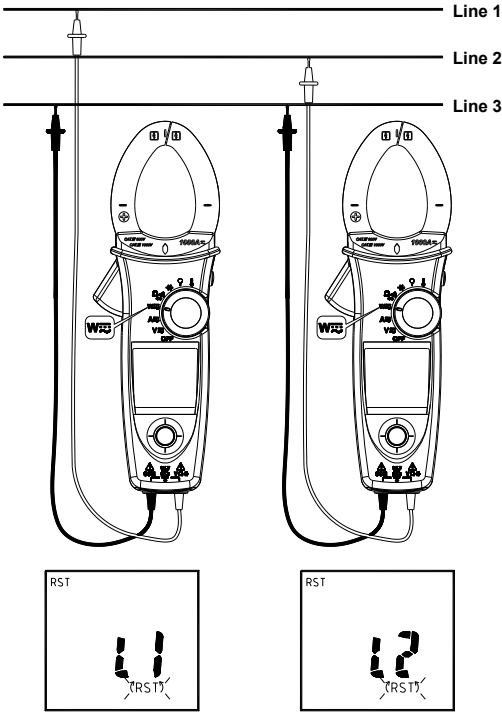
b. 3 phase 4 wire balanced / unbalanced

Step1. Set the rotary switch to the"W" position

Step2. Using the Navigator key to choose the "W" mode.



Phase Rotation



NOTE :

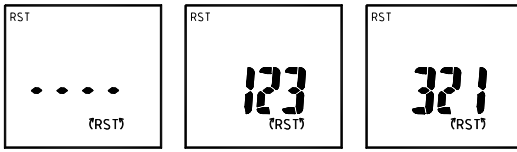
- Connect the supposed three phase of power source as shown above.
- The test is only available while the system frequency is stable.

Step 1. Set the rotary switch to the "W" position.
Step 2. Using the Navigator key to choose the " **(RST)**" mode
Step 3. Connect the Red test lead to the supposed phase Line 1, and the Black test lead to the supposed phase Line 3.

a. if volt > 1000V, it will display “OLU” and flash; if volt <30V, it will display “LoU”
b. If the frequency > 65Hz or < 45Hz, it will display “outF” and flash.
c. If it is normal, then it will display “L1” and flash for about 3 sec.

Step 4. If it displays “L2”, then BUZZER will be sound for twice. Please switch the Red test lead to connect to the supposed phase Line 2 immediately before the “ L2 ” is disappeared.

Step 5. When “L2” is disappeared, it will display the testing result.



a. If it displays “ 1 2 3 “, then the phase sequence is forward sequence, which means the supposed phase Line 1 is ahead of the supposed phase Line 2.

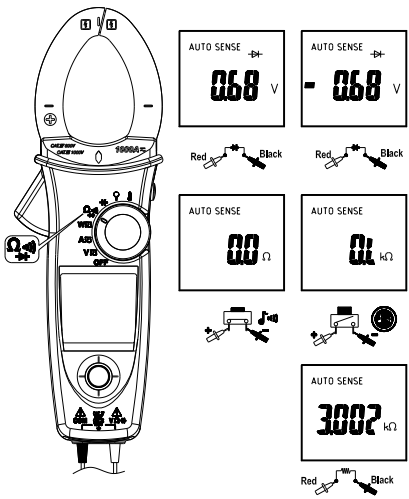
b. If it displays “ 3 2 1 ”, then the phase sequence is reversed sequence, which means the supposed phase Line 2 is ahead of the supposed phase Line 1.

c. Display “– – – –“ means it is unable to judge.

d. If displays “LoU”, it is possible that you remove the test leads before completing the whole testing procedures.

Step 6 : To repeat the test, using the Navigator key to choose the " 《RST》 " mode again.

OHM Measurment



CAUTION

To avoid possible damage to the Meter or to the equipment under test, disconnect circuit power and discharge all high voltage capacitors before measuring resistance and diode.

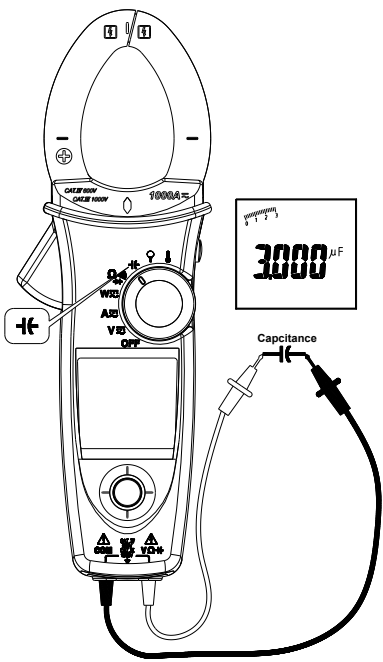
Note :

- Select "Ω", "''" or "$" indicator then press the navigator key to enter the Ω/"/ $mode.
- Select "Ω", "''" or "$" indicator then press the navigator key for more than 2sec to return to the AUTO SENSE mode.

Note - Under diode mode, LCD displays "bad" when measuring a diode conducted at forward and reverse bias.

Measuring Capacitance

Set the rotary switch to the " **%** " position.



CAUTION

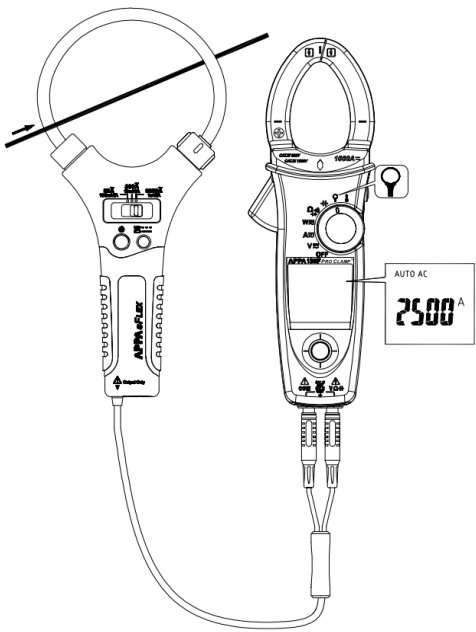
To avoid possible damage to the meter or to the equipment under test, disconnect circuit power and discharge all high-voltage capacitors before measuring capacitance. Use the DC voltage function to confirm that the capacitor discharged.

Note - The meter will display “diSC” while discharging the capacitor.

Measuring Current with APPA sFLEX-T

Set the rotary switch to the " " position.

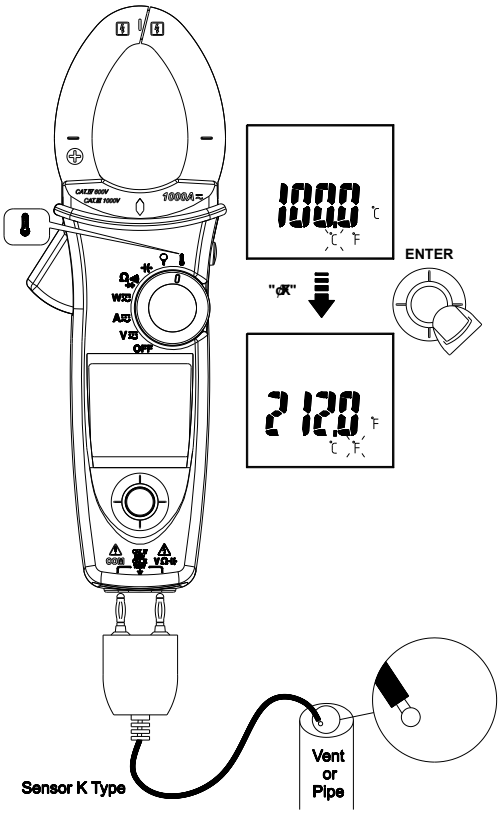
Keep the range of **sFLEX-T** at 3000A.



Note：Please measure a known current to make sure that METRAVI sFlex-T and 107F operate correctly.

Measuring Temperature ˚C / ˚F

Set the rotary switch to the "🌡" position.

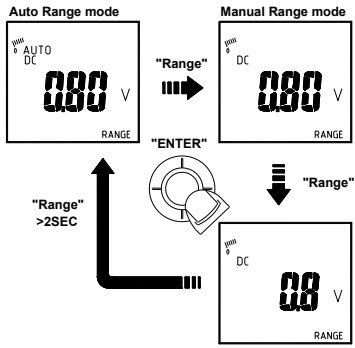


Don't take any high voltage measurement prior to accurate °C/°F measurements.

Other Function :

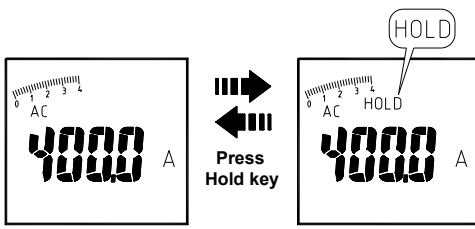
AUTO/MANUAL RANGE

Select the “RANGE“ indicator then press the navigator key to enter the manual range mode. To return to the auto range mode, press the navigator key for more than 2sec.



HOLD Key

Press HOLD key to freeze display value.

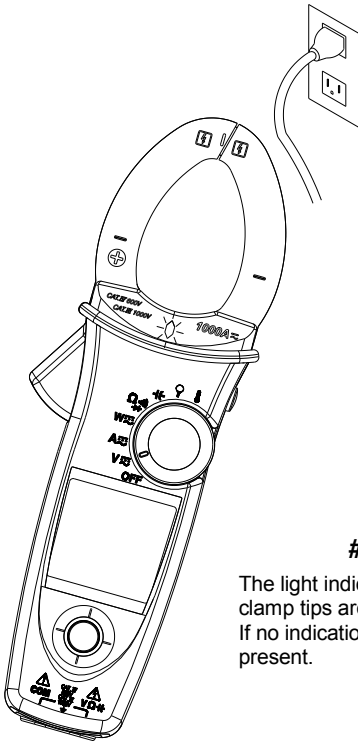


SMART HOLD： The meter will beep continuously and the display will flash if the measured signal is larger than the display reading.
(for V, A, W, and Flex AC current function)

VoltSense :

The red diamond shape of LED will Illuminate, If there has electric field been detected form the jaw.

Note - This function is invaild for OHM measurement.



Caution

The light indicator turns on while the clamp tips are close to a electric field. If no indication, voltage could still be present.

Buzzer
The Meter beeps once for every valid key-press, and beeps twice for every invalid key-press.

Power-up options:

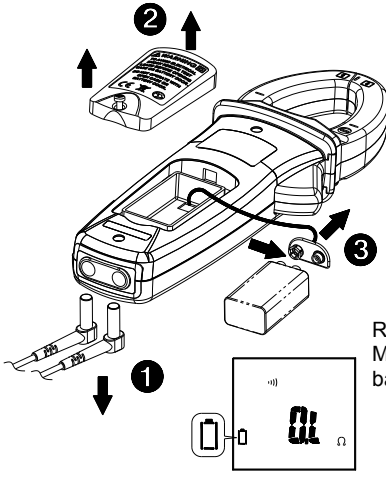
Press one of the following keys while tuning meter on from OFF position.
Upward of Navigator key : Display of the software version.
Downward of Navigator key : Disable auto power off.
Leftward of Navigator key : Disable active backlight.
HOLD KEY : Display all LCD symbols approx 10sec.

Battery State display

User can know the battery state from the battery indicator.

Batter State	Description
	The battery is full charged
	The battery is remained 2/3 power
	The battery is remained 1/3 power
	Replace the battery as soon as the low battery indicator appears, to avoid inaccurate reading.

Battery Replacement



HCaution
Remove test leads from Meter before opening the battery cover or Meter case.

Specifications

General Specifications

Display count : 10000
Measuring rate : 3 times / sec.
Overrange display : "OL" or "-OL" .
Auto Power Off : Approx 15 minutes.
Low battery indicator : ▯ is displayed. Replace the battery when the indicator ▯ appears in the display.
Power requirement : 9V battery.
Battery life : ALKALINE 9V 50 hours (without Backlight).
Dimensions :
87.5mm(W) x 257mm(L) x 50.5mm(D)
Weight : approx. 470g (with battery)

Environmental Conditions
Indoor Use.
Calibration : One year calibration cycle.
Operating temperature : 0 °C ~ 10 °C
10 °C ~ 30 °C (≦80% RH)
30 °C ~ 40 °C (≦75% RH)
40 °C ~ 50 °C (≦45%RH)
Storage temperature : -10 to 50 °C
0 to 80% RH (batteries not fitted).
Temperature coefficient :
0.2 x (Specified accuracy) / °C, < 18°C, > 28°C .

Over voltage category : IEC 61010-1 600V CAT.Ⅳ.
1000V CAT.Ⅲ.
IEC 61010-2-32, IEC 61010-2-33

CAT	Application field
Ⅰ	The circuits not connected to mains.
Ⅱ	The circuits directly connected to Low-voltage installation.
Ⅲ	The building installation.
Ⅳ	The source of the Low-voltage installation.

Operating altitude : 2000m (6562 ft)
Conductor Size : 42mm diameter
Pollution degree : 2
EMC : EN 61326-1
Shock vibration : Sinusoidal vibration per MIL-T- 28800E (5 ~ 55 Hz, 3g maximum).
Drop Protection : 4 feet drop to hardwood on concrete floor.

Electrical Specifications

Accuracy is ±(% reading + number of digits) at 23°C ± 5°C < 80%RH.

(1) Voltage

Function	Range	Accuracy*
DCV	99.99V	± (0.7% + 2dgt)
	999.9V	
ACV	99.99V	± (1.0% + 5dgt)
	999.9V	50 ~ 500Hz
HFR	99.99V	50 ~ 60Hz ± (1% + 5dgt)
ACV	999.9V	>60 ~ 400Hz ± (5% + 5dgt)

* DCV <1000dgt, add 6 dgt to the accuracy.
ACV <1000dgt, add 3 dgt to the accuracy.

Overload protection : $1000V_{rms}$

Input Impedance : 3.5MΩ // <100pF

AC Conversion Type : AC Conversions are ac-coupled, true RMS responding, calibrated to the RMS value of a sine wave input. Accuracies are given for sine wave at full scale and non-sine wave below half scale. For non-sine wave (50/60Hz) add the following Crest Factor corrections:
For Crest Factor of 1.4 to 2.0, add 1.0% to accuracy.
For Crest Factor of 2.0 to 2.5, add 2.5% to accuracy.
For Crest Factor of 2.5 to 3.0, add 4.0% to accuracy.
CF 3 @ 460V, 460A
2 @ 690V, 690A

AC+DC Vrms Accuracy : same as ACV spec. +DCV spec.

(2) Current

Function	Range	Accuracy
DCA	99.99A	± (1.5% + 0.2A)
	999.9A*	± (1.5% + 5dgt) **
ACA	0.10A ~ 99.99A	50 ~ 60Hz ± (1.5% + 5dgt)¨
	999.9A*	>60 ~ 400Hz ± (2% + 5dgt)¨
HFR	0.10A ~ 99.99A	50 ~ 60Hz ± (1.5% + 5dgt) **
ACA	999.9A*	>60 ~ 400Hz ± (5% + 5dgt)**

** The measured value <1000dgt, add 5 dgt to the accuracy.
Overload protection : 1000A_{rms} For

Position Error : ±1% of reading.

AC Conversion Type and additional accuracy is same as AC Voltage.

AC+DC Arms Accuracy : Same as ACA spec + DCA spec.

- For better measurement accuracy of high current and the constraint of temperature increasing of maximum range 1000A AC, do not measurement more than 10min. and have rest time with 30min. at least in between every measurement
- DCA affected by the temperature and the residual magnetism. Press HOLD key > 2sec to compensate it.

(3) Peak Hold : Peak MAX / Peak MIN

Function	**Range**	**Accuracy**
ACV	140.0V	± (3.0% + 15dgt)
	1400V	
ACA	140.0A	± (3.0% + 15dgt)
	1400A	

Overload protection : 1000 V_{rms}
1000 A_{rms}
Accuracy defined for :
Sine wave, ACV>5Vrms / ACA≧5Arms, Freq.50~400Hz.

- Only suitable for the repetitive events.

(4) Frequency

Function	**Range**	**Accuracy**
Frequency	20.00 ~ 99.99Hz	± (0.5% + 3dgt)
	20.0 ~ 999.9Hz	
	0.020 ~ 9.999KHz	

Overload protection : 1000 V_{rms} 1000 A_{rms}
Sensitivity :
10~100Vrms for AC 100V range

10~100Arms for AC 100A range (>400Hz Unspecified)
100~1000Vrms for AC 1000V range
100~600/1000Arms for AC 600A/1000A range
(>400Hz Unspecified)
- Reading will be 0.0 for signals below 10.0 Hz.

(5) Total Harmonic Distortion :

Function	**Range**	**Accuracy**
ACA /ACV	99.9%	± (3.0% + 10dgt)

Harmonic distortion measurement :

Harmonic order	**Range**	**Accuracy**
H01 ~ H12	99.9%	± (5% + 10dgt)
H13 ~ H25		± (10% + 10dgt)

Overload protection : 1000 V_{rms} 1000 A_{rms}

- If ACV<10Vrms or ACA <10Arms, it will display “rdy”.
- If the fundamental frequency out of range 45 ~ 65Hz, it will display “out.F”.

(6) Inrush Current :

Function	**Range**	**Accuracy**
ACA	99.99A	± (2.5% + 0.2A)
	999.9A *	± (2.5% + 5dgt)

Overload protection : 1000 V_{rms} 1000 A_{rms}

Accuracy defined for :

Sine wave, ACA≧10Arms, Freq. 50/60Hz

- Integration time about 100m sec

(7)Active Power : Watt (DC/AC)

Function	Range	Accuracy
ACW / DCW	9.999 kW**	A,error×V,reading+

	99.99 kW	V,error×A,reading
	999.9kW*	

** The measured value<1.000kW，add 10 dgt to the accuracy.

Overload protection : 1000 V_{rms} 1000 A_{rms}

Accuracy defined for :

ACW :

Sine wave , ACV≧ 10 Vrms, ACA≧ 5 Arms

Freq. 50~60Hz, PF=1.00

DCW:

DCV ≧ 10V , DCA ≧ 5 A

(8) Power Factor

Function	**Range**	**Accuracy***
PF	1.00	±5dgt

Overload protection : 1000 V_{rms} 1000 A_{rms}

(9) Resistance & Continuity & Diode :

Function	**Range**	**Accuracy**
Resistance	999.9 Ω	± (1.0% + 5dgt)
	9.999 kΩ	± (1.0% + 3dgt)
	99.99 kΩ	
Continuity	999.9 Ω	± (1.0% + 5dgt)
Diode	0.40~ 0.80V	± 0.1V

Overload protection : 1000V_{rms}

Max. Test Current : Approx. 0.5mA.

Maximum Open Circuit Voltage for Ω, ": Approximate 3V

Maximum Open Circuit Voltage for diode : Approximate ±1.8V

Continuity Threshold : ＜30Ω Beep On.
＞100Ω Beep OFF.

Continuity Indicator : 2 KHz Tone Buzzer

Continuity response time : < 100ms.

(10) Capacitance :

Function	Range	Accuracy
Capacitance	3.999 μF	± (1.9% + 8dgt)
	39.99 μF	

	399.9 μF	
	3999 μF	

Overload protection： 1000 V_{rms}

(11) Flex AC Current (voltage input):

Function	Range(1mV/1A)	Accuracy*
ACA	300.0A/3000A	1%+5dgt (50~500Hz) **
HFR ACA	300.0A/3000A	1%+5dgt(50~60Hz) ** 5%+5dgt(61~400Hz) **
Peak	420.0A/4200A	3%+80dgt(50~500Hz)
INRUSH	300.0A/3000A	2%+10dgt(50/60Hz)
Frequency	99.99Hz/999.9Hz	0.5%+3dgt(<500Hz)
THD	99.9%	5%+10dgt
Harm H01-H12	99.9%	5%+10dgt

*The accuracy of METRAVI sFlex-T is not included.

**ACA <300dgt, add 3 dgt to the accuracy.

Overload protection : 1000V_{rms}

Trigger level of INRUSH : 1% of current range

(12) Temperature

Function	Range	Accuracy
°C	-50 °C ~ 99.9 °C	± (1% + 2°C)
	100 °C ~ 399.9 °C 400 °C ~ 1000 °C	± (1% + 1°C)
°F	-58 °F ~ 211.9 °F	± (1% + 4°F)
	212.0 °F ~ 751.9 °F 752 °F ~ 1832 °F	± (1% + 2°F)

Overload protection : 1000 V_{rms}

- The above specification is assumed at the ambient temperature stability within ±1°C. In addition, the temperature probe has to be connected to meter for more than 1 hour in advance.
  The meter needs 2 hour for stability for ambient temperature change more than ± 5°C.

Limited Warranty

This Meter is warranted to the original purchaser against defects in material and workmanship for 2 years from the date of purchase. During this warranty period, manufacturer will, at its option, replace or repair the defective unit, subject to verification of the defect or malfunction.

This warranty does not cover fuses, disposable batteries, or damage from abuse, neglect, accident, unauthorized repair, alteration, contamination, or abnormal conditions of operation or handling.

Any implied warranties arising out of the sale of this product, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited to the above.

The manufacturer shall not be liable for loss of use of the instrument or other incidental or consequential damages, expenses, or economic loss, or for any claim or claims for such damage, expense or economic loss.

Some states or countries laws vary, so the above limitations or exclusions may not apply to you.

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